

WHAT IS CLAIMED IS:

1. A snowmobile, comprising:
  - a vehicle body frame;
  - at least one slide rail disposed below the vehicle body frame;
  - an extendable member capable of being extended and contracted within a prescribed range;

a front torque arm having a plurality of coupling locations, the front torque arm being coupled with the vehicle body frame at an upper front coupling location, the front torque arm being coupled with the extendable member at a lower front coupling location located generally below the upper front coupling location, the front torque arm being coupled with the at least one slide rail at an intermediate front coupling location located generally below the upper front coupling location and generally above the lower front coupling location; and

a rear torque arm having a plurality of coupling locations, the rear torque arm being coupled with the vehicle body frame at an upper rear coupling location, the rear torque arm being coupled with the extendable member at a lower rear coupling location located generally below the upper rear coupling location, the rear torque arm being coupled with the at least one slide rail;

wherein the vehicle body frame, the front torque arm, the rear torque arm, and the extendable member define a four-node linkage that provides for the vertical distance between the vehicle body frame and the at least one slide rail to vary.

2. The snowmobile of Claim 1, wherein the four-node linkage has a fully expanded configuration that defines a maximum vertical distance between the vehicle body frame and the at least one slide rail, and the upper front coupling location, the upper rear coupling location, the lower front coupling location, and the lower rear coupling location are positioned in a quadrilateral arrangement in the fully expanded configuration, and wherein the four-node linkage has a fully contracted configuration that defines a minimum vertical distance between the vehicle body frame and the at least one slide rail, and the upper front coupling location, the upper rear coupling location, the lower front coupling location, and the

lower rear coupling location are positioned in a quadrilateral arrangement in the fully contracted configuration.

3. The snowmobile of Claim 2, wherein the upper front coupling location, the upper rear coupling location, the lower front coupling location, and the lower rear coupling location are positioned in a quadrilateral arrangement in every configuration of the four-node linkage between the fully expanded configuration and the fully contracted configuration.

4. The snowmobile of Claim 1, wherein the four-node linkage has a plurality of configurations for varying the vertical distance between the vehicle body frame and the at least one slide rail, wherein the upper front coupling location, the upper rear coupling location, the lower front coupling location, and the lower rear coupling location are positioned in a quadrilateral arrangement in each of the plurality of configurations.

5. The snowmobile of Claim 1, additionally comprising a shock absorber having a first end and a second end, the first end being coupled with the four-node linkage near an upper portion of the front torque arm and the second end being coupled with the four-node linkage near an upper portion of the rear torque arm.

6. The snowmobile of Claim 1, additionally comprising a shock absorber having a first end and a second end, the first end being coupled with the four-node linkage near an upper portion of the front torque arm and the second end being coupled with a portion of the at least one slide rail.

7. The snowmobile of Claim 1, wherein the extendable member comprises a shock absorber.

8. The snowmobile of Claim 1, wherein the rear torque arm is coupled with the at least one slide rail at an intermediate rear coupling location located generally below the upper rear coupling location and generally above the lower front coupling location.

9. A snowmobile, comprising:  
a vehicle body frame;  
at least one slide rail disposed below the vehicle body frame;  
an extendable member capable of being extended and contracted within a prescribed range;

a front torque arm having a plurality of coupling locations, the front torque arm being coupled with the vehicle body frame at one or more front frame coupling locations, the front torque arm being coupled with the at least one slide rail at a front rail coupling location, the front torque arm being coupled with the extendable member at a front member coupling location, the coupling locations being configured such that the front rail coupling location is located rearward of a plane passing through the one or more front frame coupling locations and the front member coupling location; and

a rear torque arm having a plurality of coupling locations, the rear torque arm being coupled with the vehicle body frame at one or more rear frame coupling locations, the rear torque arm being coupled with the at least one slide rail at a rear rail coupling location, the rear torque arm being coupled with the extendable member at a rear member coupling location;

wherein the vehicle body frame, the front torque arm, the rear torque arm, and the extendable member define a four-node linkage that provides for the vertical distance between the vehicle body frame and the at least one slide rail to vary.

10. The snowmobile of Claim 9, wherein the four-node linkage has a fully expanded configuration that defines a maximum vertical distance between the vehicle body frame and the at least one slide rail, and the one or more front frame coupling locations, the one or more rear frame coupling locations, the front member coupling location, and the rear member coupling location are positioned in a quadrilateral arrangement in the fully expanded configuration, and wherein the four-node linkage has a fully contracted configuration that defines a minimum vertical distance between the vehicle body frame and the at least one slide rail, and the one or more front frame coupling locations, the one or more rear frame coupling locations, the front member coupling location, and the rear member coupling location are positioned in a quadrilateral arrangement in the fully expanded configuration.

11. The snowmobile of Claim 10, wherein the one or more front frame coupling locations, the one or more rear frame coupling locations, the front member coupling location, and the rear member coupling location are positioned in a quadrilateral arrangement in every

configuration of the four-node linkage between the fully expanded configuration and the fully contracted configuration.

12. The snowmobile of Claim 9, wherein the four-node linkage has a plurality of configurations for varying the vertical distance between the vehicle body frame and the at least one slide rail, wherein the one or more front frame coupling locations, the one or more rear frame coupling locations, the front member coupling location, and the rear member coupling location are positioned in a quadrilateral arrangement in each of the plurality of configurations.

13. The snowmobile of Claim 9, additionally comprising a shock absorber having a first end and a second end, the first end being coupled with the four-node linkage near an upper portion of the front torque arm and the second end being coupled with the four-node linkage near an upper portion of the rear torque arm.

14. The snowmobile of Claim 9, additionally comprising a shock absorber having a first end and a second end, the first end being coupled with the four-node linkage near an upper portion of the front torque arm and the second end being coupled with a portion of the at least one slide rail.

15. The snowmobile of Claim 9, wherein the extendable member comprises a shock absorber.

16. The snowmobile of Claim 9, wherein the plurality of coupling locations of the rear torque arm are configured such that the rear rail coupling location is located rearward of a plane passing through the one or more rear frame coupling locations and the rear member coupling location.

17. A snowmobile, comprising:  
a vehicle body frame;  
at least one slide rail disposed below the vehicle body frame;  
an extendable member capable of being extended and contracted within a prescribed range;  
a front torque arm having a plurality of coupling locations, the front torque arm being coupled with the vehicle body frame at a front frame coupling location, the front torque arm being coupled with the at least one slide rail at a front rail coupling

location, the front torque arm being coupled with the extendable member at a front member coupling location; and

a rear torque arm having a plurality of coupling locations, the rear torque arm being coupled with the vehicle body frame at a rear frame coupling location, the rear torque arm being coupled with the at least one slide rail at a rear rail coupling location, the rear torque arm being coupled with the extendable member at a rear member coupling location;

wherein the coupling locations are configured such that the front frame coupling location, the rear frame coupling location, the front member coupling location, and the rear member coupling location generally define the nodes of a quadrilateral shape, and the front rail coupling location is located generally within the bounds of the quadrilateral shape.

18. The snowmobile of Claim 17, wherein the four-node linkage has a fully expanded configuration that defines a maximum vertical distance between the vehicle body frame and the at least one slide rail, and the front frame coupling location, the rear frame coupling location, the front member coupling location, and the rear member coupling location are positioned in a quadrilateral arrangement in the fully expanded configuration, and wherein the four-node linkage has a fully contracted configuration that defines a minimum vertical distance between the vehicle body frame and the at least one slide rail, and the front frame coupling location, the rear frame coupling location, the front member coupling location, and the rear member coupling location are positioned in a quadrilateral arrangement in the fully expanded configuration.

19. The snowmobile of Claim 18, wherein the front frame coupling location, the rear frame coupling location, the front member coupling location, and the rear member coupling location are positioned in a quadrilateral arrangement in every configuration of the four-node linkage between the fully expanded configuration and the fully contracted configuration.

20. The snowmobile of Claim 17, wherein the four-node linkage has a plurality of configurations for varying the vertical distance between the vehicle body frame and the at least one slide rail, wherein the front frame coupling location, the rear frame coupling

location, the front member coupling location, and the rear member coupling location are positioned in a quadrilateral arrangement in each of the plurality of configurations.

21. The snowmobile of Claim 17, additionally comprising a shock absorber having a first end and a second end, the first end being coupled with the four-node linkage near an upper portion of the front torque arm and the second end being coupled with the four-node linkage near an upper portion of the rear torque arm.

22. The snowmobile of Claim 17, additionally comprising a shock absorber having a first end and a second end, the first end being coupled with the four-node linkage near an upper portion of the front torque arm and the second end being coupled with a portion of the at least one slide rail.

23. The snowmobile of Claim 17, wherein the extendable member comprises a shock absorber.

24. The snowmobile of Claim 17, wherein the rear rail coupling location is located generally outside the bounds of the quadrilateral shape.

25. A snowmobile, comprising:

a vehicle body frame;

at least one slide rail disposed below the vehicle body frame;

an extendable member capable of being extended and contracted within a prescribed range;

a front torque arm;

a rear torque arm; and

means for coupling together the vehicle body frame, the front torque arm, the rear torque arm, and the extendable member so as to define a four-node quadrilateral linkage system being coupled with the at least one slide rail and being capable of moving between a fully extended position and a fully contracted position while maintaining the quadrilateral shape in at least both the fully extended and fully contracted positions.

26. The snowmobile of Claim 25, additionally comprising a shock absorber coupled with the four-node quadrilateral linkage system.

27. The snowmobile of Claim 25, wherein the extendable member comprises a shock absorber.

28. A snowmobile, comprising:

a vehicle body frame;

a first slide rail and a second slide rail, the first and second slide rails being disposed below the vehicle body frame;

a front torque arm assembly having an upper portion and a lower portion, the upper portion of the front torque arm assembly being coupled with the vehicle body frame and the lower portion of the front torque arm assembly being coupled with the first and second slide rails at front pivot locations, the front torque arm assembly being rotatable relative the first and second slide rails about the front pivot locations;

a rear torque arm assembly having an upper portion and a lower portion, the upper portion of the rear torque arm assembly being coupled with the vehicle body frame and the lower portion of the rear torque arm assembly being coupled with the first and second slide rails at rear pivot locations, the rear torque arm assembly being rotatable relative the first and second slide rails about the rear pivot locations;

a first protrusion extending from the lower portion of the front torque arm assembly, the first protrusion being integrally rotatable with the front torque arm assembly, the first protrusion extending below the front pivot locations;

a second protrusion extending from the lower portion of the rear torque arm assembly, the second protrusion being integrally rotatable with the rear torque arm assembly; and

an extendable member having a first end and a second end, the first end of the extendable member being coupled with the first protrusion and the second end of the extendable member being coupled with the second protrusion, the extendable member capable of being extended and contracted within a prescribed range.

29. The snowmobile of Claim 28, additionally comprising:

a third protrusion extending from the upper portion of the front torque arm assembly, the third protrusion being integrally rotatable with the front torque arm assembly, the third protrusion extending generally below where the front torque arm assembly is coupled with the vehicle body frame;

a fourth protrusion extending from the upper portion of the rear torque arm assembly, the fourth protrusion being integrally rotatable with the rear torque arm assembly, the fourth protrusion extending generally above where the rear torque arm assembly is coupled with the vehicle body frame; and

a shock absorber having a first end and a second end, the first end of the shock absorber being coupled with the third protrusion and the second end of the shock absorber being coupled with the fourth protrusion.

30. The snowmobile of Claim 28, wherein the four-node linkage comprises:

a first node defined by a first shaft coupling together the vehicle body frame and the front torque arm assembly;

a second node defined by a second shaft coupling the front torque arm assembly with the extendable member;

a third node defined by a third shaft coupling together the vehicle body frame and the rear torque arm assembly; and

a fourth node defined by a fourth shaft coupling the rear torque arm assembly with the extendable member.

31. The snowmobile of Claim 28, wherein the four-node linkage has a fully expanded configuration that defines a maximum vertical distance between the vehicle body frame and the first and second slide rails, and the first node, the second node, the third node, and the fourth node are positioned in a quadrilateral arrangement in the fully expanded configuration, and wherein the four-node linkage has a fully contracted configuration that defines a minimum vertical distance between the vehicle body frame and the first and second slide rails, and the first node, the second node, the third node, and the fourth node are positioned in a quadrilateral arrangement in the fully contracted configuration.

32. The snowmobile of Claim 31, wherein the first node, the second node, the third node, and the fourth node are positioned in a quadrilateral arrangement in every configuration of the four-node linkage between the fully expanded configuration and the fully contracted configuration.

33. The snowmobile of Claim 28, wherein the four-node linkage has a plurality of configurations for varying the vertical distance between the vehicle body frame and the first



and second slide rails, wherein the first node, the second node, the third node, and the fourth node are positioned in a quadrilateral arrangement in each of the plurality of configurations.

34. The snowmobile of Claim 28, wherein the extendable member is disposed between the first protrusion and the second protrusion, and generally between the first and second slide rails.

35. The snowmobile of Claim 28, wherein the extendable member comprises a shock absorber.

36. The snowmobile of Claim 28, wherein the second protrusion extends below the rear pivot locations.

37. A snowmobile, comprising:

a vehicle body frame;

at least one slide rail disposed below the vehicle body frame;

a front torque arm coupled with the vehicle body frame at an upper front coupling location, the front torque arm being coupled with the at least one slide rail at a lower front coupling location located generally below the upper front coupling location; and

a rear torque arm coupled with the vehicle body frame at an upper rear coupling location, the rear torque arm being coupled with the at least one slide rail at a lower rear coupling location located generally below the upper front coupling location; and

an extendable member having a first end and a second end, the first end being coupled with the front torque arm at a location near the lower front coupling location, the second end being coupled with the rear torque arm at a location near the lower rear coupling location.

38. The snowmobile of Claim 37, wherein the extendable member is disposed generally between first and second slide rails.

39. The snowmobile of Claim 37, wherein the extendable member comprises a shock absorber.